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I, ANNA MAIJA MADL, ACTING TEAM LEADER EXAMINATION SUPPORT & SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PP 7901 for a patent by ENNIO PTY LTD filed on 23 December 1998.

WITNESS my hand this
Fifteenth day of February 2000

A. M. Madl.

ANNA MAIJA MADL
ACTING TEAM LEADER
EXAMINATION SUPPORT & SALES

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ENNIO PTY LTD

ORIGINAL

AUSTRALIA

PATENTS ACT 1990

PROVISIONAL SPECIFICATION FOR AN INVENTION ENTITLED:-

"A TUBULAR PRODUCT HAVING A MAXIMUM EXTENSIBLE DIAMETER"

This invention is described in the following statement:-

This invention relates to a tubular product, and in particular to an elasticated tubular product having a predetermined maximum extensible diameter.

The main application for elasticated tubular products of the variety described in this specification is in the food industry. However, the invention is not restricted to this application. Tubular products such as knitted netting or elasticated knitted fabric casing are used in the cooking and curing process of meat products. In the cooking of certain meat products, it is common to pack the meat pieces into an elasticated tubular net. The tubular net compresses the meat pieces and holds them together during the cooking process.

Such elasticated tubular products are normally removed from the cooked meat product can then be further packaged for sale. Elasticated tubular products are also used on cured meat products such as ham and metwurst.

The means of filling elasticated tubular product normally comprises fitting the tubular product onto a cylindrical mandrill, which is known as a stuffing tube and using the machine to pump meat product under pressure through the stuffing tube. The elasticated tube is drawn onto the external surface of the stuffing tube prior to the filling operation. Once sufficient elasticated tube is on the stuffing tube, the end is clipped and meat pumped into the elasticated tube which is drawn off the stuffing tube as it is filled.

Such machines can be used either with minced meat product, meat portions or whole meat muscle.

The elasticated tube can be clipped at intervals. The spacing of these intervals depends on the length of product required.

It is difficult to maintain a constant diameter as the casing is being filled. Tubular product that is commonly used such as tubular netting is able to expand to quite large diameters. The required diameter is normally achieved by controlling the

pumping pressure into the stuffing tube. However, it is still possible to produce a filled tube that varies considerably in diameter. This is quite undesirable. For example, compressed meat product that is to be sliced must not exceed certain diameters. Some slicing machines are unable to cut product once it exceeds a particular diameter for that machine. There may be wastage if there is excessive variation in diameter. Also, product of uniform diameter is more visually appealing.

In addition, the elasticated tube preferably must be produced so that it can be stretched by hand to enable it to be used with meat loading machines.

Accordingly, it is an aim of the invention to provide an elasticated tube which is incapable of expanding beyond a preset diameter.

In producing elasticated tubular product, it is common to make use of elasticated thread. An elasticated thread is a combination of a rubber thread with natural or synthetic yarns wrapped around it. A large number of turns of yarn per centimetre of rubber thread is normally used to cover the rubber surface.

Elasticated threads formed in this way have more than adequate extensibility. In fact, elasticated thread remains extensible beyond the desired maximum which causes the problem of bulging when the elasticated tubes are filled.

Accordingly, the broadest form of the invention is an elasticated tube that includes a circumferential elastic thread or threads, said elasticated tube having a predetermined elastic limit so that below said elastic limit, said thread or threads are elastically extensible, and that at said elastic limit, said elasticated tube becomes inextensible so that said casing has a maximum predetermined diameter to which it may expand.

The normal method of manufacturing elasticated tubular product is by circular knitting machines. Accordingly, the elastic circumferential thread is a spiral that extends along the length of the tubular product. In the case of tubular netting,

longitudinal stitches connect the circumferential elastic thread so that there is a continuous spacing of the elasticated thread along the length of the tube, and the longitudinal stitches are spaced at regular intervals around the circumferences of the tube.

In one aspect of the invention, the elastic thread is provided with an elastic limit by controlling the rate at which the yarn is wrapped onto the external surface of the rubber thread. The applicant has found that the elastic limit can be set by controlling the number of turns of yarn per centimetre of elastic thread.

As the elastic thread is stretched, the yarn, which is a helix around the rubber thread, moves with the rubber thread so that the helix expands. At the same time, the helix reduces in diameter as the rubber thread diameter reduces through stretching. The expansion of the helix and its continual reduction in diameter reaches a limit whereby further tensile force applied to the elastic thread is resisted by the yarn when it reaches a point where the yarn helix can no longer stretch with the rubber thread.

Although the yarn wrapped around the rubber thread does not completely straighten, it does reach a point whereby the helix is unable to straighten any further. This is a result of the rubber thread being virtually uncompressible circumferentially so that although there is a small helix, it is for all purposes essentially straight and all strain is taken by the yarn rather than the rubber thread.

Once the tensile force is taken by the yarn and it is no longer able to further expand, then the elastic thread becomes inextensible. That is, further force applied to thread will not result in any additional extension. Accordingly, below this limit extension is a function of the force. At the elastic limit, the thread then becomes inextensible.

The elastic limit is determined by the number of turns of yarn per centimetre around the rubber thread. The limit can therefore be predetermined, and as such

elasticated tubular product can be produced which will have a maximum diameter to which it can expand. Once it reaches the maximum diameter, the circumferential elastic threads become inextensible and rigid.

Accordingly, an elasticated tubular product can be produced that will expand to a preset diameter. This preset diameter is determined by the elastic limit of the circumferential thread used, and the diameter of the tubular product as it comes off the knitting machine. By adjusting these two variables, then the desired diameter can be readily achieved.

For example, a single strand rubber thread having approximately 9 turns of yarn per centimetre knitted into a tubular net having a relaxed diameter of approximately 12 cm will have a maximum expansion of approximately 20 cm. In this example, the casing is able to expand an additional 8 cm before it reaches its maximum diameter. This enables the elasticated tube to be pulled onto a stuffing tube which has a diameter of 17 cm.

Once the tubular net reaches its maximum diameter, the circumferential threads will continue to apply considerable compressive force to the product within. This compressive force will be maintained even though there may be some shrinkage of the product contained within.

The elastic limit may be produced in a number of ways. As described above, it is common to use yarn wrapped around a rubber thread. However, other wrapping patterns may be used such as multiple threads wrapped in different directions, or the use of rubber material which may itself only be extensible to a certain limit.

In an alternative aspect of the invention, additional circumferential threads may be incorporated into the elasticated tube which themselves are designed to become taut at a predetermined diameter. These additional circumferential threads are able to slide with respect to the elasticated tube as it expands to the preset diameter. There will be considerable slack in the additional circumferential threads

when the elasticated tube is at its relaxed diameter, however these threads will become taut at the predetermined diameter, and therefore, not be as readily apparent on the surface of the elasticated tube.

As an example, the elasticated tube may comprise a continuously knitted tubular member that has spaced circumferential elastic threads extending along the length of the knitted casing. Between the elasticated threads, additional circumferential threads may be incorporated into the knitted casing. The thread may be retained to the knitted casing as intervals by being incorporated within a stitch of the knitted casing. Depending on the predetermined diameter, the additional circumferential thread will hang quite loosely until the elasticated tube is filled. Upon filling, the additional circumferential thread will be able to slide relative to the retaining stitches and will obviously become taut once the elasticated tube reaches the predetermined diameter. At this point, the elasticated tube will not expand any further.

In addition to creating a predetermined diameter, it is possible to produce controlled variation in diameter along the length of an elasticated tube. This is possible with both embodiments of the invention described above. For example, the rate of yarn wound around the elasticated threads can be varied so that varying maximum diameters along the length of the tube if possible. In the case of the use of additional circumferential threads, the rate at which these are fed into the knitted tube can be varied so that the maximum circumferential diameter along the length of the elasticated tube can be varied.

These processes enable varying shapes to be produced. For example, alternating large and small diameter sections can be produced along the length of the casing, or spherical and elliptical shapes can be produced. In addition, shapes such as the traditional parma ham can also be produced.

As will be seen from the above description, the invention will be extremely useful, it will provide a means whereby the diameter of product can be strictly controlled below a maximum required diameter.

Dated this 23rd day of December, 1998.

ENNIO PTY LTD
By its Patent Attorneys
MADDERNS